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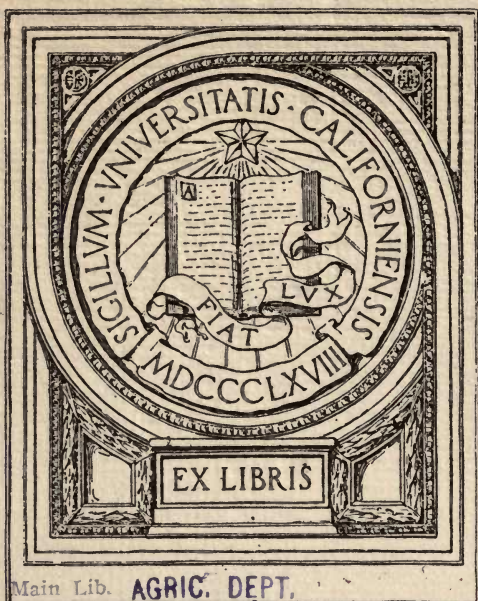
SB 116 624

CALIFORNIA STATE BOARD OF HORTICULTURE.

RUSSIAN THISTLE. 1905

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STATE HORTICULTURAL COMMISSION

ELLWOOD COOPER, Commissioner

THE RUSSIAN THISTLE

ITS INTRODUCTION AND SPREAD
IN CALIFORNIA, WITH LAWS AND
MEASURES FOR ITS CONTROL

WITH A DESCRIPTION OF THE CANADA AND
SCOTCH THISTLES

SACRAMENTO

W. W. SHANNON, : : : : : SUPERINTENDENT STATE PRINTING
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*California State Commission
" Routes etc.*

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TO THE
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THE CALIFORNIA STATE COMMISSION OF HORTICULTURE

THE RUSSIAN THISTLE.

Description, and Measures for Its Control.

The Legislature of California, at its thirty-sixth session, passed an Act, which was approved by the Governor on March 20, 1905, increasing the duties of the Horticultural Commissioners and local inspectors of the different counties by providing that they should be required to "super-vise the destruction of scale insects, diseases, Russian thistle or salt-wort, or other noxious weeds."

This law, under the statutes, went into effect sixty days from date of signing, which was on May 20th. Since the imposition of these new duties upon the horticultural officers of the State, there have been numerous inquiries at this office as to how the Russian thistle may be recognized and what are to be considered as noxious weeds. The question of what shall be considered "noxious weeds," we suppose, will have to be left largely to the County Boards of Horticulture and the Boards of Supervisors, for weeds that are exceedingly noxious in some portions of the State can hardly be considered so in others; but in the matter of new weeds there can be no doubt, and this is particularly true of the Russian, the Canada, and the Scotch thistles, and especially so of the former, which has already obtained a foothold in several of our counties, but which has not as yet become so firmly established as to be beyond possibility of extirpation.

From the fact that the Russian thistle is a new weed in our State, there exists a vast amount of ignorance concerning it. Owing to its name, which is an absurd misnomer, every species of thistle and many other weeds are mistaken for it, and from various sources we learn of its existence over the length and breadth of the State, but in most cases our informants are mistaken.

The fact is, that, at present, this pest is confined to so limited an area in California that it may be said not to exist here, and it is in order that our Horticultural Commissioners and local inspectors and others interested may be able to recognize this weed on sight, and also to realize the great importance of totally eradicating it where it may be discovered, that this bulletin is published. The necessity of this is forced upon us by the fact that, since the law became operative, very

many of our Horticultural Commissioners, anxious to do their duty under its provisions, have sent to this office specimens of various weeds under the impression that they were the Russian thistle, but in no case has this supposition been correct.

In the first place, it should be understood that the "Russian thistle" is not a thistle at all. It does not belong to the thistle family; in fact, does not resemble a thistle in any respect—in its habits of growth, foliage, inflorescence, seeds, or methods of distribution. It is as much like a cabbage as it is like a thistle, and how it got its name is a mystery. It may be that, as the uninformed in California call all plants with thorns cactuses, so the Dakota farmers, when they saw that the plant had prickles, concluded that all prickly plants must be thistles, and so gave it this name; but if our readers want to recognize the "Russian thistle," they must not look for a thistle. In its native land this weed is called "Leap-the-field," which is certainly more descriptive, and the German colonists in Russia call it "wind witch." Either of these names is more suitable than that of thistle.

The Russian thistle is a tumbleweed and is somewhat related to our American tumbleweed (*Amaranthus albus*), which, in its turn, is near to our common pigweed or red-root (*Amaranthus* sp.). Its scientific name is *Salsola kali* var. *tragus*. It is an annual, coming from seed each year, and in California makes its appearance in March and April. The first leaves are two small tender shoots, about an inch in length, somewhat resembling grass blades. Between these seed leaves the true stem soon makes its appearance. This is lined with sharp-pointed, slender leaves, from the axils of which branches are soon thrown out. Its growth during the early stages is rather slow, and the plant, being then young and tender, is eaten by stock; horses, cattle, and sheep devouring it eagerly. When about two months old the plant begins to blossom: it loses its tenderness, the stem becomes dry and rigid, with reddish stripes, the spines on the leaves become hard, and the true leaves fall off. The flowers are very small, of a greenish color, and inconspicuous, each borne in the axil of a leaf and surrounded by three small, spiny bracts. Although the flowers are borne separately upon the stem, they appear in multitudes on the plant, and each produces its seed.

As the plant increases in age it also increases greatly in size, until it forms a dense, bushy mass of spiny branches, frequently from 2 to 3 feet in height and from 4 to 6 feet in diameter. Each of these branches is lined its entire length with seeds, and it has been estimated that a single plant of average size, from 2 to 3 feet in diameter, and weighing from 2 to 3 pounds, at maturity, when dry, will bear from 20,000 to 30,000 seeds, while there have been found single plants weighing 20 pounds, with a diameter of 6 feet, which, it was estimated, would yield 200,000 seeds.

The whole plant is borne upon a single, short, slender stem, half an inch or less in diameter, which, when the plant ripens, dries and becomes very brittle. Under pressure of the first hard wind, it snaps off, and the weed goes bounding along before the wind, distributing the seeds in every direction. In Dakota, specimens which had been tagged were traced for a distance of from 10 to 15 miles, so it will be readily understood that a single plant may be the cause of infesting a very large area of territory in a few seasons, and the necessity of extirpating every specimen on sight will be appreciated.

The seed is described as quite small, of rather peculiar shape, and the whole space inside the coat is occupied by the embryo or young plant, there being no albumen, as is the common condition in the grains. After the plant is mature, the branches lose their red and green color and become dry and bleached in appearance. The root, which is at no time very well developed, then breaks off near the surface and the plant is ready to start on its seed-scattering journey before the wind. And it is well suited to this mode of transportation. It is light, wiry, and strong; its shape is pretty nearly that of a sphere, and it goes bounding across fields until it is stopped by a fence or a ditch or vegetation, leaving its seeds scattered over miles of surface, ready to sprout as soon as favorable conditions shall arise.

The following technical description is taken from Bulletin No. 15, Division of Botany, U. S. Department of Agriculture, by L. H. Dewey:

“*Salsola kali tragus* (L.) Moq. in D. C. Prod., XIII, 2, 187 (1849). A herbaceous annual, diffusely branching from the base, $1\frac{1}{2}$ to 3 feet (0.5 to 1 m.) high and twice as broad, smooth or slightly puberulent; tap root dull white, slightly twisted near the crown; leaves alternate, sessile; those of the young plant deciduous, succulent, linear or subterete, 1 to 2 inches (3 to 6 cm.) long, spine-pointed, with narrow, denticulate, membranaceous margins near the base; leaves of the mature plant persistent, each subtending two leaf-like bracts and a flower at intervals of one twelfth to five twelfths of an inch (2 to 10 mm.), rigid, narrowly ovate, often denticulate near the base, spine-pointed, usually striped with red like the branches, three twelfths to five twelfths of an inch (6 to 10 mm.) long; bracts divergent, like the leaves of the mature plant in size and form; flowers solitary and sessile, perfect, apetalous, about five twelfths of an inch (10 mm.) in diameter; calyx membranaceous, persistent, inclosing the depressed fruit, usually rose-colored, gamosepalous, cleft nearly to the base into five unequal divisions, about one sixth of an inch (4 mm.) long, the upper one broadest, bearing on each margin near the base a minute tuft of very slender coiled hairs, the two nearest the subtending leaf next in size, and the lateral ones narrow, each with a beak-like connivent apex, and bearing midway on the back a membranaceous, striate, erose-margined horizontal wing one twelfth

of an inch (2 mm.) long, the upper and two lower wings much broader than the lateral ones; stamens five, about equaling the calyx lobes; pistil simple; styles two, slender, about one twenty-fifth of an inch (1 mm.) long; seed one, obconical, depressed, one sixteenth of an inch (nearly 2 mm.) in diameter, dull gray or green, exalbuminous, the thin seed-coat closely covering the spirally coiled embryo; embryo green, slender, about one half inch (12 mm.) long when uncoiled, with two linear cotyledons. The plant flowers in July or August, and the seeds mature in September and October. At maturity, the action of the wind causes the root to break with a somewhat spiral fracture at the surface of the frozen ground, and the plant is blown about as a tumbleweed. The mature flower with the inclosed seed is held in place by the minute tufts of coiled hairs, preventing the seeds from falling all at once when the plant begins to roll."

This plant is especially well adapted to California conditions, and should it once obtain a foothold here would prove the most serious of any of our imported weed-pests. It is well adapted to our arid conditions, maturing its seed early in the season, in readiness for the first north wind to start it on its journey of seed-distribution. The plant is a native of eastern Europe or western Asia, where it is as unfavorably known as it is now in the Dakotas. It was first introduced in the Dakotas in Bonhomme County, in flax seed imported from Europe in 1873. In a few years it increased with terrible and destructive rapidity, until in 1892, Mr. Dewey, Assistant Botanist of the U. S. Department of Agriculture, estimated that the cost to the farmers of Dakota alone in loss of crops was over \$2,000,000 for that season. In 1893 this estimate was increased for the West to from \$3,000,000 to \$5,000,000, and this has since been largely augmented by the greatly increased area subjugated by the pest.

From a circular of Prof. L. H. Dewey, Assistant Botanist of the U. S. Department of Agriculture, treating on the Russian thistle, we take the following:

"The injury to crops is of course the most important item in the damage caused by the Russian thistle. It takes complete possession of the land, crowding out other plants. Flax, wheat, rye, barley, and oats all suffer from its effects, not only in the reduction of the crop but in the lower grade of that which is harvested. Corn, potatoes, vegetables, and, in fact, nearly all cultivated crops are injured more or less, proportionately to their lack of care and cultivation.

"The spiny character, added to the rigid, bushy habit of the plant, makes it one of the most disagreeable of weeds to handle. When mature it can not be plowed under, and it is often impossible to plow fields at all until the thistles are removed. Binders can not be run where the thistles are abundant, and even the working of the headers

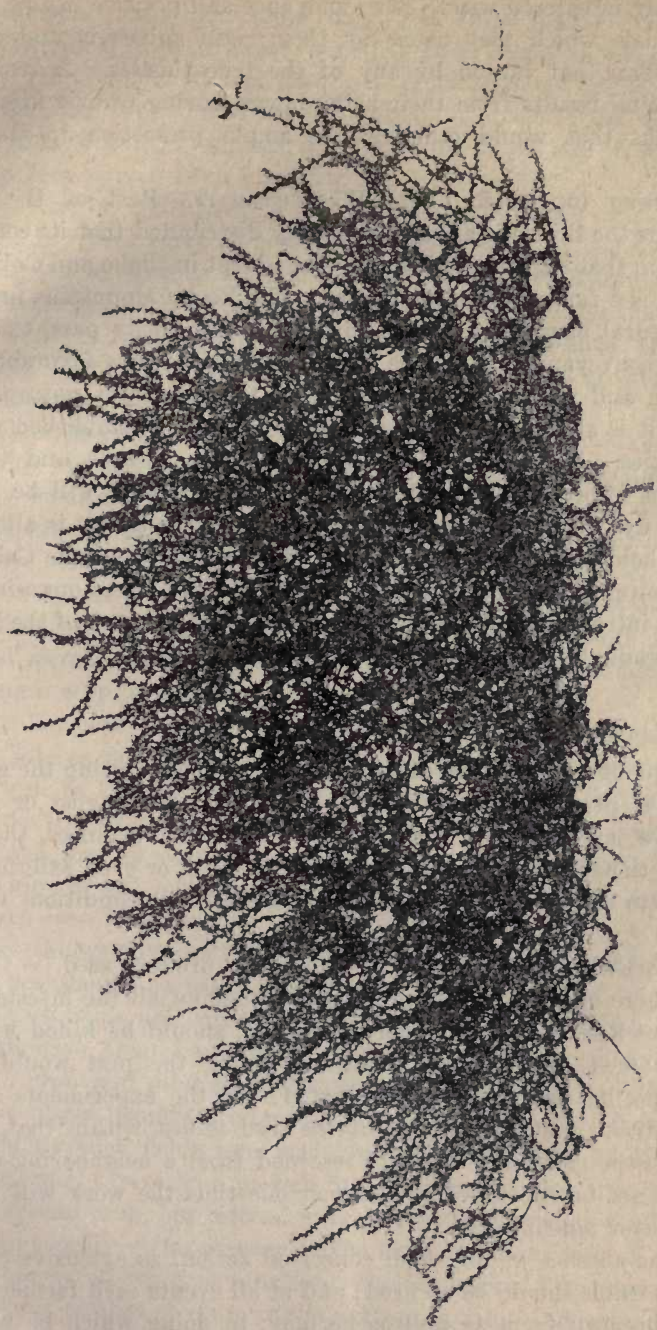


FIG. 1.—Russian thistle. The above plant, which was fully three feet in diameter, was found near Madison, Wis.

is seriously interfered with. The annoyance and positive injury to men and animals which they cause by their rigid spines is undoubtedly greater than that caused by any of the true thistles. A trouble of another kind results from their being blown during prairie fires across fire breaks that would otherwise be ample protection to stacks or buildings.

“Warning to Pacific Coast Wheat-growers.—East of the Rocky Mountains the thistle is already so widely distributed that its continued progress in that region is inevitable. Its advent in Idaho and California, however, is a far more serious matter. The Rocky Mountains present a great natural barrier which the thistle will not easily pass, except by artificial conveyance. With the natural conditions thus favorable to its exclusion, and with a full knowledge of the disastrous nature of the scourge, it is almost criminal to allow it to become established west of the Rockies. To the Pacific Coast the Sierra Nevada and Cascade mountains afford additional protection, but some seed will be sure to find its way over this barrier also, especially if the thistle is allowed to obtain a hold in the Great Basin. In view of these facts, the California wheat-grower should take precautions against the weed, opposing both its direct introduction into California from the plains east of the Rockies and its gradual advance by way of the Great Basin.

“REMEDIES.

“The plant is an annual, easily killed at any time during the growing season. It produces no seed before the middle of August or first of September, and the seed is short-lived. The circumstances, therefore, are exceptionally favorable for its being checked, or even exterminated. In order to secure a complete extirpation these two conditions must be fulfilled:

“1. No Russian thistle shall be allowed to produce seed.

“2. There must be concerted action throughout all the infested area.

“If the Russian thistle, wherever found, should be killed before it produces seed during three successive years, the pest would in all probability be completely exterminated; for the experiments already made indicate that the vitality of the seed is lost within that period. But since the ground is so easily reseeded from a neighboring crop, if action is not taken everywhere and at one time the work will have to be done over indefinitely.

“In the absence of universal concerted action, as extensive coöperation as possible should be secured; and at all events each farmer should protect his own farm as well as he may, in doing which he will also avoid injuring his neighbor. The want of coöperation is a great disadvantage. Farmers in some instances have so far succeeded in keeping

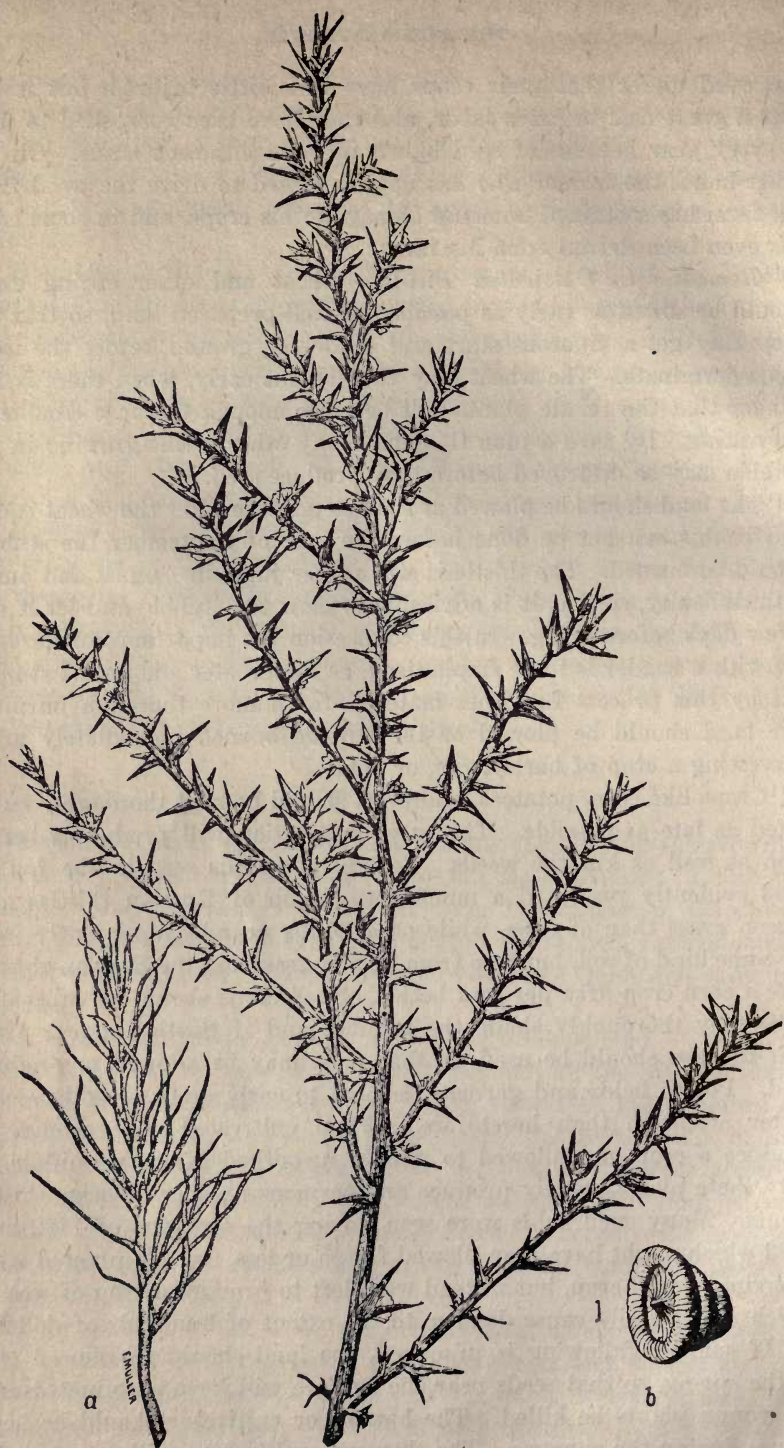
the weed under that their crops have been little injured, but it has cost a great deal in extra labor, and they have been compelled to fight it every year because of seed blown in from adjacent lands. On the other hand, the farmer who has not attempted to drive the weed from his farm has sustained immense damage to his crops, and in some cases has even been driven from his farm.

“Remedies in Cultivated Fields.—Wheat and other spring crops should be sowed as early as possible on well-prepared land, so that the crop may get a vigorous start and shade the ground before the weed seeds germinate. The wheat may then be cut early, when there is less danger that the thistle plants will be large enough to cause trouble in harvesting. By such a plan this and many other weeds growing in the stubble may be destroyed before they produce seed.

“The land should be plowed as soon as possible after the wheat is cut, and if this can not be done before the first of September the stubble should be burned. The thistle is still rather juicy in August and burns with difficulty, so that it is advisable to mow the stubble and let it dry a few days before firing. In this connection the importance of harvesting with a header is to be emphasized, as the greater amount of stubble left by this process furnishes material for a more thorough burning. The land should be plowed or the stubble burned immediately after harvesting a crop of barley, rye, or oats.

“Crops like corn, potatoes, and beets should be kept thoroughly cultivated as late as possible. The extra cultivation will produce a better crop as well as kill the weeds. Several cornfields seen in the fall of 1893 evidently produced a much better crop of Russian thistles and pigeon grass than of corn, while other fields near by, apparently with the same kind of soil, but free from pigeon grass and the Russian thistle, bore a corn crop fifty per cent better. Such crops should be cultivated until they thoroughly shade the ground, and if thistles appear after that the hoe should be used, so that none may be allowed to produce seed. Potato fields and gardens devoted to early crops should receive better attention than heretofore. When cultivated only enough to produce a crop and allowed to remain unworked after the middle of July these places usually produce an enormous number of large thistle plants. Many such fields were seen during the autumns of 1892 and 1893 which might have been plowed for \$5 or less, or even planted with a paying second crop, but instead were left to produce a crop of weeds, which might easily cause damage to the extent of hundreds of dollars.

“If summer-fallowing is practiced, the land should be plowed late in the spring, so that seeds near the surface will have germinated and the young plants be killed. The harrow or cultivator should be kept in use during the summer. The thorough cultivation will improve the condition of the soil for future crops as well as keep the weeds from



2.—Branch from Russian thistle, showing appearance of plant when seeds are mature; a, branch from a young plant, showing the appearance before the dry season; b, mature seed, enlarged five times. (From U. S. Dept. of Agriculture.)

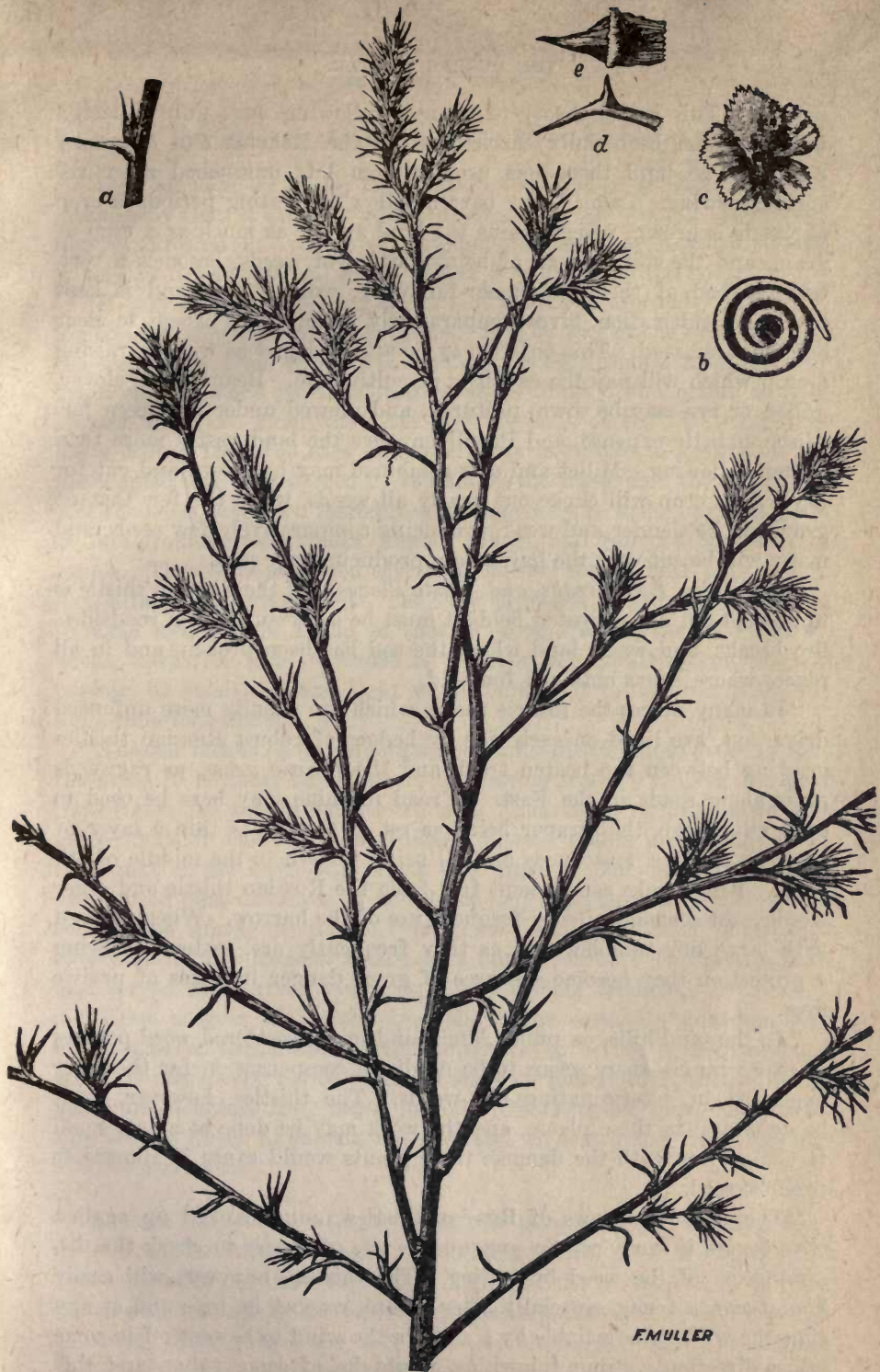


FIG. 3.—Branch of Russian thistle, showing appearance before flowering and before the spiny branchlets have elongated; *a*, spines, enlarged; *b*, young grain with the covering removed, enlarged about seven times; *c*, blossom removed from the axil and viewed from below, enlarged about four times; *d*, section of fruiting calyx, side view; *e*, same, seen from above. (From U. S. Dept. of Agriculture.)

seeding. This is the theory of summer-fallowing, but, unfortunately, it has seldom been fully carried out in the Dakotas and adjoining States. The land there has usually been left untouched after the spring plowing. Instead of a barren fallow or 'resting period,' a crop of weeds is grown, which drains the land almost as much as a crop of grain, and the soil, instead of being cleared of weeds, becomes a veritable hotbed of them. Summer-fallowing, even if the land is kept barren by cultivation, gives comparatively little benefit except to clear out the weed seed. This object may be attained just as well by raising a crop which will pay the expenses of cultivation. Beans, peas, clover, millet, or rye may be sown, pastured, and plowed under for green fertilizer at little expense, and it will improve the land vastly more than barren fallowing. Millet and oats combined may be grown and cut for hay. This crop will choke out nearly all weeds, while the few that do grow will be slender and weak, producing comparatively few seeds, and many will be cut with the hay before producing any seed.

"Roadsides, Fire Breaks, and Waste Places.—If the Russian thistle is to be kept out of cultivated fields it must be exterminated on roadsides, fire breaks, and waste land where the sod has been broken, and in all places where it has obtained foothold.

"In many places the prairie roads, which are usually mere unfenced driveways, are lined on each side by hedges of robust Russian thistles growing between the beaten track and the prairie grass, as ragweeds grow along roads in the East. A road machine may here be used to good advantage, the scraper being so set as to take as thin a layer of earth as possible, and weeds and all being thrown to the middle of the track. Fire breaks can be kept free from the Russian thistle and other weeds most economically by frequent use of the harrow. When covered with large dry tumbleweeds, as they frequently are, instead of being a protection they become a source of great danger in times of prairie fires.

"In the sand hills, on public lands, and in the scattered weed patches of cattle ranges there seems to be no direct compensation for the labor expended in exterminating the weeds. The thistles, however, must be destroyed in these places, and the work may be done at a cost small in comparison with the damage these plants would cause if allowed to produce seed.

"The great windrows of Russian thistles found banked up against wire fences in early winter suggest the use of fences to check the dissemination of the weed by rolling. The thistles, however, will easily bound over a fence, especially after a bank reaches its top; and at any time the whole pile is liable by a shift in the wind to be sent off in some other direction. Prompt burning would be of some value, and this would be possible if metallic fence posts were used.

“AVENUES OF INTRODUCTION TO BE GUARDED.

“Like all noxious weeds, the Russian thistle may be kept out much more easily than it can be eradicated when once established. In regions not yet infested all avenues of introduction should be watched so that it may be discovered and killed before it can obtain a footing.

“It may be expected along all lines of railroads, especially those having direct traffic with infested regions. It is by way of the railroads that the seeds most often enter new territory, being dropped from stock or grain cars at stock yards, elevators, and sidings. The plants usually appear first close along the tracks by the ends of the ties, where the seeds falling from the cars find conditions favorable to growth in the unoccupied soil, kept stirred by repairs on the tracks and the ballast.

“The seeds have been introduced in some cases in baled hay and grain at fair grounds, race tracks, lumber camps, and railroad construction camps. They have also been carried in shelled corn, wheat, oats, millet, flax, alfalfa, and grass seed. They are supposed to have been brought to some localities in Idaho in sheep's wool. While the seed has no hooks, barbs, or gum to cause it to stick like cocklebur or clammy cuphea, its small size and light weight enable it to retain a place for some time in a fleece.

“Another means of introduction and rapid distribution, and one that threatens to be most troublesome, is running water. During the past three years the thistle has spread with remarkable rapidity over irrigated lands in Colorado and Idaho. Robust plants are produced on the banks of the irrigating canals and ditches. The seeds from these are carried long distances by the water and deposited in the fields. In some cases quarter-sections of irrigated land have been practically covered with the Russian thistle in a single season. The plants have also spread along river banks, especially during freshets.

“These sources of introduction should be carefully guarded, and every Russian thistle seen should be destroyed before it has produced seed. If any escape notice until the seeds are mature they should be cut and burned before they begin to roll. One Russian thistle destroyed this year is likely to obviate the necessity of destroying from 1,000 to 100,000 next year.”

“Efforts have been made to check the progress of tumbleweeds or, at least, of the Russian thistle, by building fences. These efforts have been successful only in a very small degree, as the weeds pile up and are blown over the tops of the fences, and also the detached seeds are blown through. In any case the only safe and thoroughly effective method is to destroy the weeds before the seeds reach maturity.” (Yearbook, 1896.)

"The plant seems to be particularly a railway weed. It has appeared first along the railways in sixteen of the twenty-one States and Territories in which it has been introduced. In nearly all the States where it is now found its wide circulation has been chiefly by railways, in spite of the fact that railway companies have generally done more than all other parties to combat it." (Yearbook, 1896.)

CANADA THISTLE.

The Canada thistle, so called, is altogether a different plant from the Russian stranger, and is a true thistle. This pest is known by various local names, as "cursed thistle," "corn thistle," "hard thistle," and "creeping thistle," but by whatever name called it is always the same costly, unconquerable enemy of the farmer. This plant, although known as the Canada thistle, is a native of Europe and reached our country by Newfoundland, from which point of entry it has now spread west to Nebraska and south beyond Virginia. Like the great pests of our California farmers, the dreaded morning-glory and the Johnson-grass, it creeps through the soil by means of root-stocks and it is almost impossible to eradicate it, as every piece of root left in the ground forms a new plant, and the more it is cut up the more it thrives.

The following description of the thistle is given by Prof. Moses Craig, Botanist of the Oregon Agricultural Experiment Station:

"This plant differs from the common Bull thistle, for which it is often mistaken, in its slenderer, wingless stem and branches, in the thin, narrow ($\frac{1}{2}$ to $\frac{3}{4}$ inch), curled and more deeply cut leaves, less rigid prickles, and smaller flower heads which are about half an inch in diameter. It is more difficult to destroy than the common thistle, as it is a perennial, spreading by long underground stems, which penetrate deeply into the soil, often below the reach of the plow. These rhizomes extend horizontally in all directions, and being furnished with buds send branches to the surface, where a tuft of leaves is first produced, followed later by aërial stems, which bear flowers and seed. These die down to the ground every fall, but in the spring the rhizomes again send up numerous branches, which soon cover the ground, the plants spreading with surprising rapidity from year to year.

"This 'Cursed Thistle' is also propagated by seeds, which, supported by the downy pappus, are often carried long distances by the wind. Like most of our troublesome weeds it was introduced from Europe and has now become permanently established in this country. It has been reported from nine counties in Oregon, where fortunately it is not abundant.

"*Cnicus arvensis*, Hoffm. Fl. Germ. IV 180—Perennial and spreading by creeping root-stalks a foot or two high, corymbosely branching, usually glabrate and green;

stem and branches wingless; leaves lanceolate, pinnatifid and toothed, furnished with abundant weak prickles; heads loosely cymose, less than an inch high, diœcious; in male plant ovate-globular, and flowers (rose-purple) well exerted; in female oblong-campanulate and flowers less projecting; bracts of involucre all appressed, short, and with very small weak prickly points; only abortive anthers to the female flowers. Meadows, pastures, and waste grounds, from Newfoundland through the Northern and Middle Atlantic States: a too common weed. (Nat. from Eu.)

“Frequent deep plowing will, in shallow, dry soils, nearly always destroy the thistle, but in light, rich, moist soils this usually fails. Wherever a dense sod can be formed seeding will be found the easiest means of destruction, though not so rapid as plowing, hoeing, salting, or burning where these means are available. On rich bottom lands or in ground filled with stumps, a grass sod will be found the best destroyer. If the land is not rich enough to form a good sod manure it.

“Mowing when the thistle is coming into bloom does not destroy the plant, though it checks its growth. The application of kerosene or strong brine to the roots, after cutting off the tops three or four inches below the crown with a spade, is effective and practicable in small patches. In stony ground the scythe, salt, and sheep will be found good destroying agents. If the thistles are in fence rows move the fence, and plow.

“One object of thorough cultivation is that all weed seeds may germinate and be destroyed at once and not lie dormant in the ground, coming up a few at a time to reseed the field. Plowing and stirring the soil when infested with Canada thistles, unless thoroughly done, only multiplies them, so do not permit any leaves or underground stems to remain, but burn the plants immediately after cutting. The cultivation need not be deep. If all the thistles are kept cut off three inches below the surface the underground portions will soon die of exhaustion.”

SCOTCH THISTLE.

The Scotch thistle (*Onoropodium acanthium*), or Cotton thistle, has not yet made its appearance as a weed in California, and it is not nearly so much to be feared as either the Russian thistle or the Canada thistle. It is well, however, to take precautions against its introduction, for while it is not a serious pest in its native land, the changed conditions of California might also change its character. It has already obtained a permanent foothold in some parts of the East, but does not rank as a weed of the first class. It is easily kept in check by vigorous cultivation and by cutting down the plants close to the ground before blossoming.

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